

TOOTHBRUSH WITH A Laterally Oriented Head

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an improved toothbrush with a laterally oriented head.

2. Prior Art

In recent years, it has begun to be recognized that the teeth have an important effect not just on the oral cavity and digestive tract in the human body, but also on all parts of the human body, so that the importance of the teeth has been recognized. Accordingly, various types of toothbrushes for brushing and massaging the teeth have been commercially marketed.

Furthermore, food scraps adhering to the surfaces of the teeth and matter left between the teeth are commonly seen in universally known toothbrushes with a rectilinear shape. As a result, the deposition of tartar on the lower portions of the lower front teeth is commonly seen. Furthermore, brushing techniques also include various methods, and there is currently some confusion about proper instructions for brushing even among dentists.

In such toothbrushes, since the head, handle and bristles are arranged in a single straight line, it is extremely difficult to brush the areas around teeth that are distant from the center, such as the rearmost molars of the upper and lower jaw. Accordingly, experience and skill are required in order to achieve the sufficient removal of tartar and food scraps, and there is an additional drawback in that considerable time is required in order to accomplish this.

Furthermore, when a conventional rectilinear toothbrush is used, a considerable action is required: namely, the wrist must be twisted and the elbow must be raised, etc. This method is difficult even for adults and is extremely difficult for children, elderly persons and disabled persons, etc.; thus, such a method cannot easily be mastered.

In the case of such universally known rectilinear toothbrushes, the toothbrushing posture that is required in order to achieve cleaning and removal of contaminants that leave the surfaces of all of the teeth 100% clean tends to collapse in terms of human engineering as well, and is extremely difficult for children, elderly persons and disabled persons, etc., so that proper brushing cannot be accomplished even if attempted. Accordingly, toothbrushes whose shape is

such that the handle and head are formed substantially in a T shape exist as toothbrushes for facilitating brushing of the teeth (for example, see Japanese Utility Model Application No. 2000-7804).

In the innovation disclosed in Japanese Utility Model Application No. 2000-7804, the toothbrush has a T shape, with the bristle part formed in an arch shape, and it is claimed that the back sides of the front teeth can be brushed. However, since the head is twisted by 45 degrees to 90 degrees with respect to the handle, the bristles can contact only portions of the tooth surfaces, so that effective brushing is not possible. Furthermore, although the bristles should contact the surfaces of the teeth squarely, which is the most prominent characteristic of the arch-shaped bristles, only very partial contact is made, so that the brushing effect cannot be expected.

As seen from the above, though patents, utility model and design applications have been filed for the T shape or peak shape of the bristles, and such toothbrushes have also been manufactured, the frequent lack of medical, anatomical, human engineering and quantitative grounds are cited as reasons for the failure to perfect toothbrushes that can be adequately used.

SUMMARY OF THE INVENTION

As a result of experiments performed from a dental standpoint, the inventor of the present application has ascertained various medical, anatomical, human engineering and quantitative facts and has substantiated the formation of the bristle peak shape with a curvature radius of 15 mm (± 1.5 mm), as well as other quantitative grounds, and has further developed and provided a T-shaped toothbrush that is actually easy to use, i.e., a toothbrush with a laterally oriented head.

Furthermore, the present invention develops and provides a toothbrush with a laterally oriented head which can thoroughly remove contaminants in the vicinity of the necks of the teeth during brushing yet is gentle on the gums and which easily allows anyone to clean all of the teeth of food scraps adhering to the surfaces of the teeth and residue between the teeth, etc., without causing the adhesion of tartar to the tongue sides of the lower front teeth, where tartar is most likely to adhere inside the oral cavity because of the presence of the sublingual gland; and the present invention develops and provides also a toothbrush with a laterally oriented head

in which the handle of the toothbrush is formed as a thick rounded handle that is easy to grip, so that a force of the order required for brushing can be securely transmitted to the tip end portion.

More specifically, the present invention is for a tooth brush with a laterally oriented head constituting a toothbrush with a conventional T shape, wherein a toothbrush, in which the overall upper surface of the bristles is cut in a circular arc shape, is devised and improved by measuring the width between the lower canine teeth, the size of the mouth and the diameter of the dental arch, so that the adhesion of food scrapes in the vicinity of the necks of the teeth is prevented, the deposition of tartar is prevented, all of the teeth are easily be cleaned by anyone of unremoved dental plaque and food scraps adhering to the surfaces of the teeth and areas between the teeth, etc., the handle of the toothbrush is formed as a thick rounded handle that is easy to grip, and the handle is formed with a shape that allows the secure transmission of a force of the order required for brushing to the tip end portion.

In the toothbrush with a laterally oriented head of the present invention, the handle and head of the toothbrush are formed in substantially a T shape, and the overall upper surface of the bristles of the head is formed in an arc shape, the overall upper surface of the bristles of the head is cut on a radius of approximately 15 mm centered on the point of intersection between the axial center of the handle and undersurface of the head, the length of the bristles is set at approximately 11 mm (± 1.1 mm) on the tip end side, and at a length that is 1 mm shorter than this on the handle side, and the overall upper surface of the bristles is formed as an inclined circular-arc-form upper surface.

As a result, the following effects are obtained: there is no excessively strong contact of the bristles with the surfaces of the teeth, there is no injury to the surfaces of the teeth or gums, the brushing effect is improved, the function of the toothbrush is much more efficient, the brushing efficiency with respect to the back surfaces of the front teeth is especially improved, and brushing can easily be accomplished by a broad range of persons ranging from small children to handicapped persons.

Furthermore, since the lateral width of the head is set at substantially 20 mm to 15 mm, both the upper and lower teeth can be brushed at the same time in the case of lateral brushing. The reason for this is as follows: the length of the crowns of the upper and lower molar teeth in

Japanese is 11.8 mm to 9.0 mm on the average, and in the case of lateral brushing, brushing is performed with the mouth closed, so that the upper and lower crowns overlap, thus shortening the distance (see Figures 13A and 13B).

Since the lower lip interferes in the case of vertical brushing, the front of the head is cut to a depth of 1 to 1.5 mm, so that a recessed portion is formed. Accordingly, in this toothbrush, the lower lip is positioned in the recessed portion, thus preventing the lower lip from interfering with brushing, so that extremely beneficial effects such as an increase in brushing efficiency are obtained.

Furthermore, since the handle is thick, a space is created from the bristle tips to the curved portion of the handle, so that the lips and chin area do not interfere during the vertical brushing of the front teeth. Accordingly, the movement of the toothbrush is light, and the gripping force used to grip the toothbrush is also light, so that the toothbrush can be nimbly moved over the surfaces of all of the teeth with a uniform force. In other words, the effect of easy movement is obtainable (see Figure 11).

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a front view of a toothbrush with a laterally oriented head according to one embodiment of the present invention;

Figure 2 is a side view thereof;

Figure 3A is a sectional view taken along the line 3A-3A in Figure 1, Figure 3B is a sectional view taken along the line 3B-3B in Figure 1, and Figure 3C is a sectional view taken along the line 3C-3C in Figure 1;

Figure 4A is an enlarged plan view of the laterally oriented brush head of one embodiment of the present invention, Figure 4B is an enlarged plan view of the laterally oriented brush head, Figure 4C is partially cut-away enlarged plan view of the laterally oriented brush head, and Figure 4D is a partially cut-away enlarged side view of the laterally oriented brush head;

Figure 5A is a partially cut-away perspective view of a toothbrush with a laterally oriented head of another embodiment of the present invention, and Figure 5B shows the same in cross-section;

Figure 6 is an enlarged view of the toothbrush of Figure 5A;

Figure 7 is an explanatory diagram that illustrates the technical content of a toothbrush with a laterally oriented head showing one embodiment of the present invention;

Figure 8 is an explanatory diagram that illustrates the technical content of a toothbrush with a laterally oriented head showing one embodiment of the present invention;

Figure 9A is an explanatory diagram of the lower jaw on which the toothbrush with a laterally oriented head according to one embodiment of the present invention is in use, and Figure 9B is an explanatory diagram for the upper jaw;

Figure 10 is an explanatory diagram that illustrates the technical content of a toothbrush with a laterally oriented head showing one embodiment of the present invention;

Figure 11 is an explanatory diagram showing the conditions of use of a toothbrush with a laterally oriented head illustrating one embodiment of the present invention;

Figure 12 is an explanatory diagram showing the conditions of use of a toothbrush with a laterally oriented head illustrating one embodiment of the present invention; and

Figure 13A is an explanatory diagram illustrating the bite for showing the crown length of the molar teeth with respect to toothbrush of the present invention, and Figure 13B is a side view of the closed state.

DETAILED DESCRIPTION OF THE INVENTION

First aspect of the present invention will be described first with reference to Figures 1 through 3.

In the toothbrush with a laterally oriented head of the present invention, a handle and a head of the toothbrush are formed substantially in a T shape, and the overall upper surface of the bristles on the head is cut or formed in an arc shape. More specifically, the shape of the overall upper surface 3a of the bristles 3 on the head 2 is formed with a curvature radius of approximately 15 mm centered on the point of intersection between the axial center X of the handle 1 and the undersurface 2a of the head 2 or centered on the point of intersection Y between the axial center X of the handle 1 and an arbitrary parallel line that is parallel to the undersurface 2a of the head 2 and is between the bristles 3 and the undersurface 2a, and the

overall upper surface 3a of the bristles 3 is formed in an arc-shape that is inclined toward the handle 1 (see Figure 4).

In the case of normal occlusion in Japanese adults, the following numerical values have been published as the standard values of the spacing between the lower canine teeth:

Males = 28.3 mm 28.8 mm

Females = 27.0 mm 28.0 mm

(Yosuke Kuwabara, Nikkyo Shishi, 1993 "*Standard values according to head X-ray standard photographs and cast measurements in contemporary Japanese adults with normal occlusion*".)

Judging from the above results, it is sufficient if the head is set at a smaller size than these values.

The inventor of the present applicant is a dentist; by surveying numerical values for 60 patients, it is ascertained that for use the following numerical values are the most appropriate for the width of the head of a toothbrush:

Persons with large mouths: lateral 20 mm (± 2.0 mm), vertical 10 mm (± 1 mm)

Persons with small mouths: lateral 15 mm (± 1.5 mm), vertical 10 mm (± 1 mm)

Accordingly, the lateral width C of the head 2 is set at around or substantially 20 mm to 15 mm.

Furthermore, the shape of the head 2 of the toothbrush can be oblong with rounded corners or in a shape in which both end portions are formed in a circular arc shape. Moreover, the above-described size is a size for Japanese males with normal occlusion; and in the case of races with a physique that differs from that of the Japanese, it is desirable that the size (of the width and/or length) of the head of the toothbrush be varied according to the standard value of the spacing between the lower canine teeth for each race.

Furthermore, according to the above-described measurements of Mr. Yosuke Kuwabara, the diameter of the dental arch is reported as follows:

Male = 33 mm (± 3 mm)

Female = 32 mm (± 3 mm)

Accordingly, as a result of experiments based on 60 patients visiting the dental clinic of the inventor of the present invention, it has been ascertained that a circle with a curvature

radius R of 15 mm (± 1.5 mm) is the circular arc that is most suitable for use, as shown in Figure 8.

From the above results, the overall upper surface 3a of the bristles 3 is determined on the basis of this finding as shown in Figure 4.

Furthermore, as shown in Figures 9A and 9B, the portions extending to the gum parts from the inside inclined surfaces of the tongue sides of the lower front teeth and the palate portions of the upper front teeth show a shallow boat hull shape in the upper jaw left 123, upper jaw right 123, lower jaw left 123 and lower jaw right 123. During brushing with a T-shaped toothbrush, the bristles 3 that are closest to the neck always contact these portions. Accordingly, dental plaque can be effectively removed while reducing the chance of harming the teeth or gums by giving these bristle tips a rounded angle. This angle is an angle that is common to toothbrushes with a lateral width of 20 mm to 15 mm.

Next, the second aspect of the present invention will be described Figure 1.

In the second aspect of the present invention for a toothbrush with a laterally oriented head in which the handle and head of the toothbrush are formed substantially in a T shape and the overall upper surface of the bristles on the head are formed in an arc shape centered on the axial center X of the handle, the lateral width C of the head 2 is set at approximately 20 mm to 15 mm.

Furthermore, the third aspect of the present invention will be described as follows with reference to Figures 5A and 5B.

More specifically, in this toothbrush with a laterally oriented head in which the handle and head of the toothbrush are formed substantially in a T shape and the overall upper surface of the bristles on the head are in an arc shape that is centered on the axial center of the handle, the lateral width C of the bristles 3' in the head 2' is set at 20 mm to 15 mm, the portions of the bristles 3' in an arc shape that are located on the neck E' side are formed in a circular arc B with a smaller curvature radius that is concentric with the curvature radius of the above-described arc shape, and the overall upper surface 3a of the bristles 3' is formed in gradual curve from an appropriate position P along the width dimension of these bristles 3' toward the circular arc B.

In regards to the conditions of the above-described upper surface 3a' of the bristles 3' that has a gradual curvature, as seen from Figure 6, the bristles 3' are cut along a gradual angle α (this can be a circular curve) to take a line J along the fourth bristle I from the third bristle H. The angle α with the center of the third bristle H or an arbitrary point near the center as the starting point K is approximately 20°.

Furthermore, the forth aspect of the present invention will be described below with reference to Figures 1 through 4.

The toothbrush of the forth aspect of the present invention has a laterally oriented head in which the handle and head of the toothbrush are formed substantially in a T shape and the overall upper surface of the bristles on the head is in an arc shape; and the portion of the handle 1 that extends from the end of the handle 1 to a point approximately halfway along the total length of the handle 1 including the head 2 is formed as a grip D which is in a square column shape, approximately 15 mm on each side. In this grip D, both corners of the upper portion of the column are beveled at a curvature radius of approximately 4 mm, and both corners of the lower portion are beveled at a curvature radius of approximately 7 mm. Furthermore, the portion of the handle 1 that extends approximately 55 mm from the tip end of the head 2 is formed as a neck E that has a diameter of approximately 6 mm, a gradually curved inclined portion F is formed between the neck E and the handle 1, and a recessed portion G that has a depth of 1 to 1.5 mm is formed between the neck E and the head 2.

Furthermore, as shown in Figure 10, since the length from a point below the nose to the chin area is approximately 60 mm in Japanese (57 mm in males and 55 mm in females), a distance of 70 mm from the tip of the head to the curved portion of the handle is sufficient as a distance that prevents interference of the lips and chin area (as seen from Figure 10).

Accordingly, as shown in Figure 11, with such a length of 60 mm, during vertical brushing, a space is formed in the handle 1 so that the grip D does not contact the chin area; and a distance that allows vertical movement of the head during vertical brushing is set at 20 mm, so that a total length of the head and neck of the toothbrush is 80 mm.

As seen from the above, since the lateral width C of the head 2 is set at 20 mm to 15 mm, the upper and lower teeth can be both brushed at the same time when lateral brushing is performed as shown in Figure 12. This is based on the fact that the crown length of the molar

teeth in Japanese is (on the average for the upper and lower teeth) 11.8 mm to 9.0 mm as shown in Figure 13; and when lateral brushing is performed with the mouth closed, the upper and lower crown parts overlap, so that this distance is shortened. Accordingly, the lateral width of the head is set at approximately 20 mm.

Furthermore, as seen from Figure 3B, the portion of the handle 1 that extends from the end of the handle 1 to a point approximately halfway along the total length of the handle 1 is formed as a grip D that constitutes a square column approximately 15 mm on the side, wherein both corners of the upper portion of this column are beveled at a curvature radius of approximately 4 mm, and both corners of the lower portion are beveled at a curvature radius of approximately 7 mm. As a result, there is no interference of the lips or chin area during vertical brushing of the front teeth, so that the brushing movement is facilitated. Moreover, the gripping force required in order to grip the grip of the toothbrush is also light, so that all of the surfaces of the teeth can be brushed by a light motion with a uniform force. In other words, there is a great advantage of easy movement.

In addition, as seen from Figure 3B, since the cross-sectional shape of the handle 1 is substantially semicircular, the handle can be gripped using a baseball grip (referring to gripping of a baseball bat) or a palm grip (referring to gripping of a golf club shaft in a sandwiching manner), and the handle 1 need merely be half-rotated in the left-right direction about the center of the handle 1, with no need for any special technique. Accordingly, areas that cannot be brushed in a conventional rectilinear toothbrush can be brushed. Thus, in the toothbrush of the present invention, consideration is given to maintaining hygiene in the oral cavity.

Furthermore, since the inclined portion F with a gradual inclination of $24^{\circ} (\pm 2.4^{\circ})$ is formed between the grip D and the neck E, gripping is easy even if the grip D is gripped with five fingers. In the toothbrush of the present invention, gripping is also easy even when the grip D is gripped with the middle finger, ring finger and little finger, and the inclined portion F is gripped with the thumb and index finger in a sandwiching manner.

The human hand is intrinsically endowed with the function of holding round objects. However, the handles of almost all existing toothbrushes has a flattened shape, so that when such handles are gripped, a space is created inside the hand or palm, so that the hand or palm does not make a tight contact with to the handle. This is clearly in opposition to the laws of

nature; and in such cases, a sufficient force cannot be transmitted to the tip of the brush. Accordingly, the handle in the toothbrush of the present invention is formed as a thick portion.

As seen from the above, the present invention is for a toothbrush with a conventional T shape and provides an improvement in a toothbrush in which the bristles are in an arc shape. The toothbrush with a laterally oriented head of the present invention can thoroughly remove contaminants in the vicinity of the necks of the teeth during brushing and is gentle on the gums, and it easily allows anyone to clean all of the teeth of food scraps adhering to the surfaces of the teeth and residue between the teeth, etc., without causing the adhesion of tartar to the tongue sides of the lower front teeth, where tartar is most likely to adhere inside the oral cavity because of the presence of the sublingual gland. Furthermore, the toothbrush of the present invention has a thick rounded handle so that the handle of the toothbrush is easy to grip, and it can firmly transmit a force of the order required for brushing to the tip end portion of the toothbrush. Mass production is possible by incorporating the above-described numerical value configurations, and the toothbrush is very effective in the cleaning of artificial teeth and the cleaning of remaining teeth and the interior of the oral cavity. Furthermore, especially in cases where all artificial teeth are used, favorable cleaning can be accomplished by making the bristles soft. Thus, the present invention has great industrial applicability.